AGEC 516

Mathematical Tools for Agricultural and Applied Economics

Fall 2016

Instructor: Jingyu Song

Contact Information:	**Course Information:**
Office: KRAN 603	Location: RAWL 1071
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Course Description and Objective:

This course covers introductory level mathematics for graduate students in Agricultural and Applied Economics. The goal is to provide students with a set of mathematical tools to support graduate coursework in microeconomics, macroeconomics, linear programming, and econometrics. This course pursues practical use of mathematics in economics rather than a rigorous treatment of mathematics itself. We will cover the basics of calculus, matrix algebra, optimization theory, and statistics, emphasizing applications to applied problems.

In completing the course, students will:

- Understand and apply mathematical and statistical methods commonly used to build economic models;
- Become familiar with mathematical notations and concepts in advanced economics courses or articles;
- Be able to follow the mathematical flow of a general process solving an economic problem.

Textbook and Materials:

No textbook is required for this course. However, many books are helpful to understanding the concepts and can provide valuable supplemental resources to the class lectures.

- **Edwards T. Dowling, Introduction to Mathematical Economics (3rd edition),** Schaum's Outlines, McGraw-Hill, 2000. ISBN-13: 9780071358965
- Alpha C. Chiang and Kevin Wainwright, Fundamental Methods of Mathematical Economics (4th edition), McGraw-Hill, 2005. ISBN-13: 9780070109100
- Carl P. Simon and Lawrence Blume, Mathematics for Economists, W. W. Norton & Company, 1994. ISBN-13: 9780393957334

- Books from previous courses taken can be helpful in reinforcing some of the concepts. This includes textbooks from calculus and/or statistics.
- *Google*, *Wikipedia*, *Wolfram MathWorld*, *MathisFun…*

Grading Policy:

The grade for this course will be based on homework assignments, class participation, and two exams. Semester grades will be determined according to the following weights:

- Homework: 25%
- Two Midterms: 20% each
- Final: 30%
- Participation: 5%

Homework will be assigned on a weekly basis and must be turned in at the beginning of the class on the due date. Late submission without prior approval of the instructor will receive a 25% penalty. Papers turned in after corrected papers have been distributed will be marked, but no credit will be given.

Homework comprises a substantial portion of the grade for this course. You are encouraged to discuss homework and strategy for solution. However, you are required to write up the homework independently. Violations of this rule will be dealt with following the University's policy (see Academic Integrity section below).

The tentative dates for the midterms are Friday, Sept. 30, and Friday, Nov. 4, during the regular class period. The date, time and location of the final exam will be announced by the University. While the exams are not strictly cumulative in nature, many of the skills required on the midterm will be useful in completing the final. A make-up exam will not be given unless there is a documented university approved absence.

Regular attendance is expected.

Communication:

Please note that my primary out-of-class method of communication will be via email to your Purdue email address. It is your responsibility to check for email on a regular basis. I recommend checking your Purdue email account at least every 24 hours.

Academic Integrity:

Academic dishonesty of any sort is strictly prohibited. Purdue polices define dishonesty as cheating, plagiarism, knowingly furnishing false information to the university, lying, using substitutes for taking examinations, illegal cribs, copying during examinations, and/or knowingly

aiding or abetting another party in committing a dishonest act (https://www.purdue.edu/odos/osrr/academic-integrity-brochure/). If you are unsure whether you actions would be considered cheating, please ask the instructor first. Anyone found to be cheating or helping someone else cheat will be referred directly to the Dean of Students for disciplinary action. Penalties are severe and may include dismissal from the University. The risks associated with cheating far outweigh the perceived benefits.

Special Needs:

If you have a disability that requires academic adjustments, please make an appointment to meet with me during the first week of classes to discuss your needs. Please note that university policy requires all students with disabilities to be registered with Adaptive Programs in the Office of the Dean of Students before classroom accommodations can be provided.

Campus Emergencies:

In the unusual event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. To get information about changes in this course, contact me by email at song173@purdue.edu, or call me at my office (494-5816).

To report an emergency, call 911. To obtain updates regarding an ongoing emergency, sign up for Purdue Alert text messages, view www.purdue.edu/ea. There are nearly 300 Emergency Telephones outdoors across campus and in parking garages that connect directly to the PUPD. If you feel threatened or need help, push the button and you will be connected immediately.

If we hear a fire alarm during class we will immediately suspend class, evacuate the building, and proceed outdoors. Do not use the elevator. If we are notified during class of a Shelter in Place requirement for a tornado warning, we will suspend class and shelter in the basement. If we are notified during class of a Shelter in Place requirement for a hazardous materials release, or a civil disturbance, including a shooting or other use of weapons, we will suspend class and shelter in the classroom, shutting the door and turning off the lights.

Please review the Emergency Preparedness website for additional information:

http://www.purdue.edu/ehps/emergency_preparedness/index.html

Course Outline:

Section 1: Review

- Basic Algebra
- Functions and Graphs
- Economic Applications of Graphs and Equations

Section 2: Calculus

- Limits and Continuity
- Fundamentals of Derivatives
- L'Hôpital's Rule
- Partial & Total Derivatives
- Implicit Function Theorem
- Integrals

Section 3: Matrix Algebra

- Vector and Matrix
- Matrix Operations
- Determinants
- Inverse
- System of Equations
- Cramer's Rule
- Jacobian and Hessian
- Definiteness

Section 4: Optimization

- Lagrangian
- Extrema and Inflection Points
- Concavity and Convexity
- Homogeneity and Homotheticity
- Univariate Optimization
- Multivariate Optimization
- Comparative Statics
- Envelope Theorem

Section 5: Probability and Statistics

- Random Variables and Sample Statistics
- Expectation/Variance
- PMF, PDF and CDF